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Rapid internal contraction boosts DNA friction

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Semiflexible polymers are routinely employed as molecular handles, linkers or force transmitters in single molecule force spectroscopy assays. Their dynamic response to external forces strongly depends on the transmission and relaxation of tension within the molecular backbone, a process that has been shown to follow a diffusion-like, yet distinctly nonlinear evolution equation [1, 2]. Using bead-attached, optically trapped DNA, we show explicitly [3] that the resulting "diffusion" of backbone tension delays DNA relaxation in a manner that may appear to the outside observer as a strongly increased viscous friction, and that this apparent friction enhancement can easily dominate even the combined drag resistance of bead and polymer taken together.

This work was supported by the DFG (FOR 877).

References

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